IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	: Russell Gaudiana	Art Unit	: 1795
Serial No.	: 10/723,554	Examiner	: Thanh Truc Trinh
Filed	: November 26, 2003	Conf. No.	: 9727
Title	: PHOTOVOLTAIC CELL WITH MESH ELECTRODE		

Mail Stop Appeal Brief - Patents
Commissioner for Patents
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CORRECTED BRIEF ON APPEAL

(1) Real Party in Interest

The real party in interest is Konarka Technologies, Inc., having a place of business at 100 Foot of John Street, Lowell, Massachusetts.

(2) Related Appeals and Interferences

Appellant is not aware of any appeals or interferences related to the above-identified patent application.

(3) Status of Claims

Claims 1-12, 14-18 and 23-82 are pending, with claims 75-80 currently being withdrawn from consideration. Claims 13 and 19-22 are cancelled.

This is an appeal from the rejection of claims 1-12, 14-18, 23-74, 81 and 82 provided by the Examiner in the Final Office Action mailed April 6, 2009. Claims 1-12, 14-18, 23-74, 81 and 82 have been twice rejected and are presented for appeal.

(4) Status of Amendments

All amendments have been entered.

(5) Summary of Claimed Subject Matter

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Claim 1 is an independent claims that covers photovoltaic cells that include a first electrode, a mesh electrode, and a photoactive layer between the first and mesh electrodes. *See, e.g.,* USSN 10/723,554, p. 2, lines 2-6, p. 5, lines 8-11, p. 12, lines 13-16 and Fig. 1. The photoactive layer includes an electron acceptor material including a fullerene. *See, e.g., id.*, p. 9, lines 11-20. The photoactive layer also includes an electron donor material including a polymer. *See, e.g., id.*, lines 11-12 and 21-25. The mesh electrode is in contact with the photoactive layer. *See, e.g., id.,* p. 5, lines 8-11 and Fig. 1. Claims 2-12, 14-18 and 23-25 depend from claim 1 and add further features thereto.

Claim 26 is an independent claim and covers photovoltaic cells that include a first electrode, a mesh electrode, a photoactive layer between the first and mesh electrodes, a hole blocking layer between the first electrode and the photoactive layer, and a hole carrier layer between the mesh electrode and the photoactive layer. *See, e.g., id.,* p. 2, lines 2-6, p. 5, lines 8-11, p. 12, lines 13-16 and Fig. 1. The photoactive layer includes an electron acceptor material including a fullerene. *See, e.g., id.*, p. 9, lines 11-20. The photoactive layer also includes an electron donor material including a polymer. *See, e.g., id.*, lines 11-12 and 21-25. The mesh electrode is in contact with the hole carrier layer. *See, e.g., id.,* p. 5, lines 8-11 and Fig. 1. Claims 27-42 depend from claim 26 and add further features thereto.

Claim 43 covers a photovoltaic system that includes a plurality of photovoltaic cells of claim 1, where at least some of the plurality of photovoltaic cells are electrically connected. *See, e.g., id.*, p. 13, lines 1-10 and Figs. 6 and 7. Claims 44-47 depend from claim 43 and add further features thereto.

Claim 48 covers a photovoltaic system that includes a plurality of photovoltaic cells of claim 26, where at least some of the plurality of photovoltaic cells are electrically connected. *See, e.g., id.*, p. 13, lines 1-10 and Figs. 6 and 7. Claims 49-52 depend from claim 48 and add further features thereto.

Claim 53 is an independent claim that covers photovoltaic cells that include a first electrode, a mesh electrode, a photoactive layer between the first and mesh electrodes, a hole carrier layer between the first electrode and the photoactive layer, and a hole blocking layer between the mesh electrode and the photoactive layer. *See, e.g., id.,* p. 2, lines 2-6, p. 5, lines 8-11, p. 12, lines 13-16 and Fig. 1. The photoactive layer includes an electron acceptor material

including a fullerene. *See, e.g., id.*, p. 9, lines 11-20. The photoactive layer also includes an electron donor material including a polymer. *See, e.g., id.*, lines 11-12 and 21-25. The mesh electrode is in contact with the hole blocking layer. *See, e.g., id.*, p. 5, lines 8-11, p. 12, lines 13-16 and Fig. 1. Claims 54-74 depend from claim 53 and add further features thereto.

Claim 81 is an independent claim that covers articles that include a first electrode, a printed mesh electrode, and a photoactive layer between the first and mesh electrodes. *See, e.g., id.*, p. 2, lines 2-6, p. 5, lines 8-11, p. 12, lines 13-16 and 24-31, and Fig. 1. The photoactive layer includes an electron acceptor material including a fullerene. *See, e.g., id.*, p. 9, lines 11-20. The photoactive layer also includes an electron donor material including a polymer. *See, e.g., id.*, lines 11-12 and 21-25. The article is configured as a photovoltaic cell. *See, e.g., id.*, p. 2, lines 2-6, p. 5, lines 8-11, p. 12, lines 13-16 and 24-31, and Fig. 1. Claim 82 depends from claim 81 and adds further features thereto.

(6) Grounds of Rejection to be Reviewed on Appeal[1]

The Examiner rejected claims 1-12, 14-18, 23-42, 53-62, 64-69, 81 and 82 under 35 U.S.C. §103(a) as being unpatentable over Scher et al. U.S. Patent 6,878,871 ("Scher") in view of Saricifti et al., U.S. Patent 5,331,183 ("Saricifti").

The Examiner rejected claims 43-52 and 70-74 under 35 U.S.C. §103(a) as being unpatentable over Scher in view of Saricifti and further in view of Chapin et al., U.S. Patent 2,780,765 ("Chapin").

The Examiner rejected claim 63 under 35 U.S.C. §103(a) as being unpatentable over Scher in view of Saricifti and further in view of Griffin, U.S. Patent 3,442,007 ("Griffin").

(7) Argument

Claims 1-12, 14-18, 23-42, 53-62, 64-69, 81 and 82

Claims 1-12, 14-18, 23-42, 53-62, 64-69, 81 and 82 cover photovoltaic cells that include a mesh electrode and a photoactive layer including a fullerene and a polymer.

[1] Appellant is not appealing the obviousness-type double patenting rejections with the goal of removing the reference-based claim rejections prior to addressing the obviousness-type double patenting rejection.

In rejecting these claims, the Examiner asserted that it would have been obvious to modify Scher by replacing his nanocrystals with fullerene, which is disclosed in Saricifti. *See* Final Office Action, pp. 3 and 12-13. However, in reaching this conclusion, the Examiner ignores the express teachings of Scher and Saricifti. When these express teachings are properly considered, it is readily apparent that it would not have been obvious to one skilled in the art to modify Scher based on Saricifti in the manner indicated by the Examiner.

Scher discloses a device 100 that includes an active layer 102 that includes a nanocrystal component 104 and a polymer component 106. *See* Scher, col. 14, lines 20-67 and Fig. 1. According to Scher:

> [W]hen light impinges upon the nanocrystal component of the active layer, it is absorbed by the nanocrystal creating an exciton within the nanocrystal. By conducting the electron away from the hole, one creates an electric potential that can be exploited. In the case of nanocomposite photoactive layers, this is accomplished by disposing the nanocrystal component in a conductive polymer matrix that is able to donate an electron to the nanocrystal (or conduct the hole away from the nanocrystal). *See id.*, col. 14, lines 26-35.

Scher also discloses:

> When light (as indicated by arrow 112) impinges upon the nanocrystal component 104, it creates an exciton which passes a hole (Θ) into the polymer matrix 108, and conducts the electron (e-) along the nanocrystal 104 (as indicated by the dashed line). The electron is conducted to electrode 108 while the hole is carried to electrode 106. The resulting current flow, e.g., in the direction of arrows 115 is then exploited, e.g., in load/device 114. *See id.*, lines 59-67.

Thus, based on Scher's express teachings, one skilled in the art would have understood that Scher believed that the light absorption of his nanocrystal was an important part of the mechanism by which his system converts light to electricity. As a result, based on Scher, it would not have been obvious to one skilled in the art to modify Scher's system by replacing his purportedly light-absorbing nanocrystal with a material that was not known to have comparable light absorbing properties.

Saricifti discloses a composition that can include a polymer and a fullerene. *See, e.g.,* Saricifti, Abstract, col. 2, line 35-col. 3, line 11. According to Saricftci, in his system, light is absorbed by the polymer. *See, e.g., id.*, col. 2, line 35-col. 3, line 2, col. 3, lines 38-42, col. 4, lines 53-55. Saricifti does not appear to indicate that fullerene absorbs light, let alone any role such light absorption plays in the ability of his composition to convert light to electricity.

In view of the foregoing, it would not have been obvious to one skilled in the art to replace Scher's nanocrystal with Sariciftci's fullerene. To do so would be to replace the material that Scher discloses as his light-absorbing nanocrystal with a material that Sariciftci does not indicate has light absorbing properties comparable to Scher's nanocrystal. Accordingly, Applicants request reconsideration and reversal of the rejection of claims 1-12, 14-18, 23-42, 53-62, 64-69, 81 and 82.

Claims 43-52 and 70-74

Claims 43-52 and 70-74 cover photovoltaic cells that include a mesh electrode and a photoactive layer including a fullerene and a polymer.

In rejecting these claims, the Examiner again asserted that it would have been obvious to replace Scher's nanocrystal with the fullerene disclosed in Saricifti. *See,* Final Office Action, pp. 9-10. As explained above, it would not have been obvious to one skilled in the art to modify Scher in this way. Chapin does not overcome the infirmities of the Examiner's proffered combination of Scher and Saricifti. Thus, it would not have been obvious to combine Scher, Saricifti and Chapin in the manner indicated by the Examiner to provide the subject matter covered by claims 43-52 and 70-74. Hence, Appellant requests reconsideration and reversal of the rejection of claims 43-52 and 70-74.

Claim 63

Claims 63 covers photovoltaic cells that include a mesh electrode and a photoactive layer including a fullerene and a polymer.

In rejecting this claim, the Examiner again asserted that it would have been obvious to replace Scher's nanocrystal with the fullerene disclosed in Saricifti. *See,* Final Office Action, p. 10. As explained above, it would not have been obvious to one skilled in the art to modify Scher

in this way. Griffin does not overcome the infirmities of the Examiner's proffered combination of Scher and Saricifti. Thus, it would not have been obvious to combine Scher, Saricifti and Griffin in the manner indicated by the Examiner to provide the subject matter covered by claim 63. Appellant therefore requests reconsideration and reversal of the rejection of claim 63.

The appeal brief fee of was previously paid. Appellant believes no fee is due. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

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Appendix of Claims

1. (Previously Presented) A photovoltaic cell, comprising:

a first electrode;

a mesh electrode; and

a photoactive layer between the first and mesh electrodes, the photoactive layer comprising:

an electron acceptor material comprising a fullerene; and

an electron donor material comprising a polymer,

wherein the mesh electrode is in contact with the photoactive layer.

2. (Original) The photovoltaic cell of claim 1, wherein the mesh electrode is a cathode.

3. (Original) The photovoltaic cell of claim 1, wherein the mesh electrode is an anode.

4. (Previously Presented) The photovoltaic cell of claim 1, wherein the mesh electrode comprises an electrically conductive material.

5. (Original) The photovoltaic cell of claim 4, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

6. (Original) The photovoltaic cell of claim 1, wherein the mesh electrode comprises wires.

7. (Original) The photovoltaic cell of claim 6, wherein the wires comprise an electrically conductive material.

8. (Original) The photovoltaic cell of claim 7, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

9. (Original) The photovoltaic cell of claim 6, wherein the wires comprise a coating including an electrically conductive material.

10. (Original) The photovoltaic cell of claim 9, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

11. (Original) The photovoltaic cell of claim 1, wherein the mesh electrode comprises an expanded mesh.

12. (Original) The photovoltaic cell of claim 1, wherein the mesh electrode comprises a woven mesh.

13. (Cancelled).

14. (Original) The photovoltaic cell of claim 1, wherein the electron acceptor material comprises a substituted fullerene.

15. (Previously Presented) The photovoltaic cell of claim 1, wherein the polymer comprises a material selected from the group consisting of polythiophenes, polyphenylenes, polyphenylvinylenes, polysilanes, polythienylvinylenes and polyisothianaphthalenes.

16. (Previously Presented) The photovoltaic cell of claim 1, wherein the polymer comprises poly(3-hexylthiophene).

17. (Previously Presented) The photovoltaic cell of claim 1, further comprising a hole blocking layer between the photoactive layer and the first electrode.

18. (Original) The photovoltaic cell of claim 17, wherein the hole blocking layer comprises a material selected from the group consisting of LiF, metal oxides and combinations thereof.

19-22. (Cancelled).

23. (Previously Presented) The photovoltaic cell of claim 1, further comprising a hole carrier layer between the photoactive layer and the first electrode.

24. (Original) The photovoltaic cell of claim 23, wherein the hole carrier layer comprises a material selected from the group consisting of polythiophenes, polyanilines, polyvinylcarbazoles, polyphenylenes, polyphenylvinylenes, polysilanes, polythienylenevinylenes, polyisothianaphthanenes and combinations thereof.

25. (Original) The photovoltaic cell of claim 1, wherein the first electrode comprises a mesh electrode.

26. (Previously Presented) A photovoltaic cell, comprising:

a first electrode;

a mesh electrode;

a photoactive layer between the first and mesh electrodes, the photoactive layer comprising:

an electron acceptor material comprising a fullerene; and

an electron donor material comprising a polymer;

a hole blocking layer between the first electrode and the photoactive layer; and

a hole carrier layer between the mesh electrode and the photoactive layer,

wherein the mesh electrode is in contact with the hole carrier layer.

27. (Original) The photovoltaic cell of claim 26, wherein the mesh comprises an electrically conductive material.

28. (Original) The photovoltaic cell of claim 27, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

29. (Original) The photovoltaic cell of claim 26, wherein the hole carrier layer comprises a material selected from the group consisting of polythiophenes, polyanilines, polyvinylcarbazoles, polyphenylenes, polyphenylvinylenes, polysilanes, polythienylenevinylenes, polyisothianaphthanenes and combinations thereof.

30. (Original) The photovoltaic cell of claim 29, wherein the hole blocking layer comprises a material selected from the group consisting of LiF, metal oxides and combinations thereof.

31. (Original) The photovoltaic cell of claim 26, wherein the hole blocking layer comprises a material selected from the group consisting of LiF, metal oxides and combinations thereof.

32. (Original) The photovoltaic cell of claim 26, wherein the mesh electrode comprises wires.

33. (Original) The photovoltaic cell of claim 32, wherein the wires comprise an electrically conductive material.

34. (Original) The photovoltaic cell of claim 33, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

35. (Original) The photovoltaic cell of claim 32, wherein the wires comprise a coating including an electrically conductive material.

36. (Original) The photovoltaic cell of claim 35, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

37. (Original) The photovoltaic cell of claim 26, wherein the mesh electrode comprises an expanded mesh.

38. (Original) The photovoltaic cell of claim 26, wherein the mesh electrode comprises a woven mesh.

39. (Original) The photovoltaic cell of claim 26, wherein the first electrode comprises a mesh electrode.

40. (Original) The photovoltaic cell of claim 26, further comprising a substrate supporting the mesh electrode.

41. (Original) The photovoltaic cell of claim 40, further comprising an adhesive material between the substrate and the hole carrier layer.

42. (Original) The photovoltaic cell of claim 40, wherein the hole carrier layer is in contact with the substrate.

43. (Original) A photovoltaic system comprising a plurality of photovoltaic cells of claim 1, at least some of the plurality of photovoltaic cells being electrically connected.

44. (Original) The photovoltaic system of claim 43, wherein all of the plurality of photovoltaic cells are electrically connected.

45. (Original) The photovoltaic system of claim 43, wherein at least some of the electrically connected photovoltaic cells are electrically connected in parallel.

46. (Original) The photovoltaic system of claim 43, wherein at least some of the electrically connected photovoltaic cells are electrically connected in series.

47. (Previously Presented) The photovoltaic system of claim 43, wherein at least some of the electrically connected photovoltaic cells are electrically connected ~~in~~ to a load.

48. (Previously Presented) A photovoltaic system comprising a plurality of photovoltaic cells of claim 26, at least some of the plurality of photovoltaic cells being electrically connected.

49. (Original) The photovoltaic system of claim 48, wherein all of the plurality of photovoltaic cells are electrically connected.

50. (Original) The photovoltaic system of claim 48, wherein at least some of the electrically connected photovoltaic cells are electrically connected in parallel.

51. (Original) The photovoltaic system of claim 48, wherein at least some of the electrically connected photovoltaic cells are electrically connected in series.

52. (Previously Presented) The photovoltaic system of claim 48, wherein at least some of the electrically connected photovoltaic cells are electrically connected to a load.

53. (Previously Presented) A photovoltaic cell, comprising:

a first electrode;

a mesh electrode;

a photoactive layer between the first and mesh electrodes, the photoactive layer comprising:

an electron acceptor material comprising a fullerene; and

an electron donor material comprising a polymer;

a hole carrier layer between the first electrode and the photoactive layer; and

a hole blocking layer between the mesh electrode and the photoactive layer,

wherein the mesh electrode is in contact with the hole blocking layer.

54. (Previously Presented) The photovoltaic cell of claim 53, wherein the mesh comprises an electrically conductive material.

55. (Previously Presented) The photovoltaic cell of claim 54, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

56. (Previously Presented) The photovoltaic cell of claim 53, wherein the hole carrier layer comprises a material selected from the group consisting of polythiophenes, polyanilines, polyvinylcarbazoles, polyphenylenes, polyphenylvinylenes, polysilanes, polythienylenevinylenes, polyisothianaphthanenes and combinations thereof.

57. (Previously Presented) The photovoltaic cell of claim 56, wherein the hole blocking layer comprises a material selected from the group consisting of LiF, metal oxides and combinations thereof.

58. (Previously Presented) The photovoltaic cell of claim 53, wherein the hole blocking layer comprises a material selected from the group consisting of LiF, metal oxides and combinations thereof.

59. (Previously Presented) The photovoltaic cell of claim 53, wherein the mesh electrode comprises wires.

60. (Previously Presented) The photovoltaic cell of claim 59, wherein the wires comprise an electrically conductive material.

61. (Previously Presented) The photovoltaic cell of claim 60, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

62. (Previously Presented) The photovoltaic cell of claim 59, wherein the wires comprise a coating including an electrically conductive material.

63. (Previously Presented) The photovoltaic cell of claim 62, wherein the electrically conductive material is selected from the group consisting of metals, alloys, polymers and combinations thereof.

64. (Previously Presented) The photovoltaic cell of claim 53, wherein the mesh electrode comprises an expanded mesh.

65. (Previously Presented) The photovoltaic cell of claim 53, wherein the mesh electrode comprises a woven mesh.

66. (Previously Presented) The photovoltaic cell of claim 53, wherein the first electrode comprises a mesh electrode.

67. (Previously Presented) The photovoltaic cell of claim 53, further comprising a substrate supporting the mesh electrode.

68. (Previously Presented) The photovoltaic cell of claim 67, further comprising an adhesive material between the substrate and the hole blocking layer.

69. (Previously Presented) The photovoltaic cell of claim 67, wherein the hole blocking layer is in contact with the substrate.

70. (Previously Presented) A photovoltaic system comprising a plurality of photovoltaic cells of claim 53, at least some of the plurality of photovoltaic cells being electrically connected.

71. (Previously Presented) The photovoltaic system of claim 70, wherein all of the plurality of photovoltaic cells are electrically connected.

72. (Previously Presented) The photovoltaic system of claim 70, wherein at least some of the electrically connected photovoltaic cells are electrically connected in parallel.

73. (Previously Presented) The photovoltaic system of claim 70, wherein at least some of the electrically connected photovoltaic cells are electrically connected in series.

74. (Previously Presented) The photovoltaic system of claim 70, wherein at least some of the electrically connected photovoltaic cells are electrically connected a load.

75. (Withdrawn) A method of preparing a photovoltaic cell, comprising:

supporting a mesh with a substrate, the mesh and the substrate forming at least a portion of a first electrode; and

supporting a photoactive layer with the mesh to provide a portion of the photovoltaic cell.

76. (Withdrawn) A method of preparing a module, comprising:

supporting a mesh with an advancing substrate, the mesh and the substrate forming at least a portion of each of a plurality of first electrodes; and

supporting a photoactive layer with the mesh to provide a portion of the module.

77. (Withdrawn) A method of preparing a photovoltaic cell, comprising:

supporting a mesh with a substrate, the mesh and the substrate forming at least a portion of a first electrode; and

supporting a photoactive layer with the mesh, the photoactive layer comprising an electron acceptor material and an electron donor material to provide a portion of the photovoltaic cell.

78. (Withdrawn) A method of preparing a module, comprising:

supporting a mesh with an advancing substrate, the mesh and the substrate forming at least a portion of each of a plurality of first electrodes; and

supporting a photoactive layer with the mesh, the photoactive layer comprising an electron acceptor material and an electron donor material to provide a portion of the module.

79. (Withdrawn) An article, comprising:

a first electrode;

a mesh electrode; and

an active layer between the first and mesh electrodes, the active layer comprising copper indium and gallium;

wherein the article is configured as a photovoltaic cell.

80. (Withdrawn) An article, comprising:

a first electrode;

a mesh electrode; and

an active layer between the first and mesh electrodes, the active layer comprising amorphous silicon;

wherein the article is configured as a photovoltaic cell.

81. (Previously Presented) An article, comprising:

a first electrode;

a printed mesh electrode; and

a photoactive layer between the first and mesh electrodes, the photoactive layer comprising:

an electron acceptor material comprising a fullerene; and

an electron donor material comprising a polymer;

wherein the article is configured as a photovoltaic cell.

82. (Previously Presented) The article of claim 81, wherein the printed mesh electrode has a maximum thickness of at most about 10 microns.

Evidence Appendix

None.

Related Proceedings Appendix

None.